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(54) Title: INSECTICIDAL COMPOSITIONS FOR CONTROL OF GENERAL HOUSEHOLD PESTS

(57) Abstract: The present invention relates to an insecticidal composition comprising a pyrethroid and a second insecticide selected from the group consisting of imidacloprid, nithiazine, thiamethoxam, dinotefuran, nitenpyram, thiacloprid, clothianidin and chlorfenapyr, with significantly improved knockdown and mortality characteristics when applied to general household pests.

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**INSECTICIDAL COMPOSITIONS FOR CONTROL OF GENERAL  
HOUSEHOLD PESTS**

5           This application claims the benefit of U.S. Provisional Application No. 60/535,667, filed January 9, 2004.

**FIELD OF THE INVENTION**

10           The present invention relates generally to insecticidal compositions. In particular, it pertains to compositions of insecticides useful for control of general household pests.

**BACKGROUND OF THE INVENTION**

15           General household pests are insects that have the potential to cause nuisance or harm to person and property, such as the German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug. The following are some examples of nuisance or harm to  
20           persons and property. Cockroaches and flies can appear in people's living environment at any place and at any time. They generally contaminate food and articles subjecting people to threats of bacteria and viruses. The continued proliferation of colonies of red imported fire ants, *Solenopsis invicta*, are becoming a serious problem in the United States. Fire ants are attracted to electrical circuits and  
25           can cause failures in transformers, cables, connectors and related electrical hardware. Fire ants also can sting persons or animals and generally cause a localized allergic reaction on the area of the skin punctured by their stinging. Some individuals suffer a severe allergic reaction that can lead to anaphylactic shock, which can be fatal if not treated promptly. Many of the general household pests are  
30           potentially dangerous since their bites or stings can similarly lead to allergic reaction.

          Insecticidal compositions have commonly been used to control general household pests. Of primary concern in developing an insecticidal composition to control general household pests is the insecticide's 'knockdown' and 'mortality'

characteristics. Knockdown refers to quick, short-term immobilization or death of the pest. Pests can recover from knockdown immobilization. Knockdown usually occurs within 10-30 minutes, but the timing is pest dependant. For example, knockdown for house flies can occur at up to 2 hours because of their tolerance for insecticides and recovery abilities. Mortality refers to death of the pest. An optimal insecticide composition would have knockdown and mortality rates at or near 100% for all general household pests. Current insecticidal compositions, for example, have red imported fire ant and German cockroach mortality rates approaching 100%, but their knockdown rates are only 80% or less for red imported fire ants and 40% or less for German cockroaches. Improved knockdown rates and for many pests improved mortality rates are desirable to ensure effective protection of persons and property from general household pests.

### **SUMMARY OF THE INVENTION**

It has now been unexpectedly found that applications of an insecticidal composition containing a mixture of a pyrethroid and a second insecticide selected from the group consisting of imidacloprid, nithiazine, thiamethoxam, dinotefuran, nitenpyram, thiacloprid, clothianidin and chlorfenapyr, results in a continuous chemical barrier that provides both high knockdown and mortality rates when applied to general household pests. Other aspects of the present invention will also be apparent.

### **DETAILED DESCRIPTION OF THE INVENTION**

It has now been unexpectedly found that an insecticidal composition containing a mixture of a pyrethroid and a second insecticide selected from the group consisting of imidacloprid, nithiazine, thiamethoxam, dinotefuran, nitenpyram, thiacloprid, clothianidin and chlorfenapyr, results in high knockdown and mortality rates when applied to general household pests. Preferred compositions are those wherein the pyrethroid is bifenthrin, cypermethrin, zeta cypermethrin, lambdacyhalothrin, betacyhalothrin, alphacypermethrin, tralomethrin, deltamethrin, cyfluthrin, beta-cyfluthrin, esfenvalerate, fluvalinate, etofenprox, permethrin, metofluthrin, resmethrin, bioresmethrin, allethrin, bioallethrin, s-bioallethrin or

tetramethrin. Further preferred compositions are those wherein the pyrethroid is bifenthrin.

A preferred embodiment of the present invention is a composition wherein the second insecticide is selected from the group consisting of imidacloprid, thiamethoxam and clothianidin. More preferred compositions of the present invention are comprised of from 0.001% by weight to 0.20% by weight of the second insecticide.

Another embodiment of the present invention is a method for controlling general household pests comprising applying an insecticidally effective amount of a composition comprised of a pyrethroid and a second insecticide selected from the group consisting of imidacloprid, nithiazine, thiamethoxam, dinotefuran, nitenpyram, thiacloprid, clothianidin and chlorfenapyr to a locus where general household pest control is needed or expected to be needed. Preferred general household pests are selected from German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug. Preferred locus or loci are selected from a general household pest-infested structure, a structure that is expected to be general household pest-infested, or a location adjacent to the structures.

The amount of each insecticide in the composition can be varied over a wide range depending upon the target pest and the level of control desired. For controlling German cockroaches, preferred liquid insecticide compositions of the present invention are comprised of from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of thiamethoxam; from 0.001% by weight to 0.06% by weight of bifenthrin and from 0.01% by weight to 0.10% by weight of imidicloprid; and from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of clothianidin. For controlling American cockroaches, preferred liquid insecticide compositions of the present invention are comprised of from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of thiamethoxam; from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to

0.02% by weight of imidicloprid; and from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of clothianidin. For controlling Oriental cockroaches, preferred liquid insecticide compositions of the present invention are comprised of from 0.001% by weight to 0.005% by weight of  
5 bifenthrin and from 0.0175% by weight to 0.0225% by weight of thiamethoxam; from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of imidicloprid; and from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of clothianidin. For controlling red imported fire ants (RIFA), preferred liquid  
10 insecticide compositions of the present invention are comprised of from 0.001% by weight to 0.06% by weight of bifenthrin and from 0.01% by weight to 0.10% by weight of imidicloprid; and from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of clothianidin. For controlling house flies, preferred liquid insecticide compositions of the present  
15 invention are comprised of from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.0025% by weight to 0.02% by weight of thiamethoxam; from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of imidicloprid; and from 0.001% by weight to 0.005% by weight of bifenthrin and from 0.01% by weight to 0.02% by weight of clothianidin. For  
20 controlling Yellow Fever Mosquitoes, a preferred liquid insecticide composition of the present invention is comprised of 0.001% by weight to 0.005% by weight of bifenthrin and 0.01% by weight to 0.02% by weight of clothianidin.

A liquid insecticide is any formulation containing an insecticide where the formulation is dispensed in an aqueous medium prior to its application to a locus  
25 where general household pest control is needed. That is to say, a liquid insecticide is made up of 1) an insecticide, 2) an aqueous medium and 3) other additives conventionally employed in insecticidal formulations (e.g. surfactants, wetting agents, freeze/thaw agents). All formulations of insecticides that are or can be dispensed in an aqueous medium prior to application are, therefore, within the scope  
30 of the present invention (e.g. Micro-emulsions, Suspension concentrates, Emulsifiable concentrates, Wettable powders, Water dispersible granules, Capsule suspensions, Emulsifiable granules or combinations thereof).

The compositions of the present invention may be prepared from commercially available formulations of insecticides. For example, bifenthrin, sold by FMC Corporation under the names and trademarks of TALSTAR® GC FLOWABLE INSECTICIDE/MITICIDE, or TALSTARONE® MULTI-  
5 INSECTICIDE, to name a few, find utility in the present invention. A formulation of imidicloprid that is particularly useful in the context of the present invention includes, without limitation, imidicloprid (sold under the name and trademark of MERIT), sold as a wettable powder (WP). A formulation of thiamethoxam that is particularly useful in the context of the present invention includes, without  
10 limitation, thiamethoxam (sold under the name and trademark of CENTRIC), sold as a 25% water dispersible granular (WDG). A formulation of clothianidin that is particularly useful in the context of the present invention includes, without limitation, clothianidin as a 16% water dispersible granular (WDG). Using methods known to one skilled in the art, the above-mentioned formulations of insecticides  
15 can be dispersed in an aqueous medium to provide a composition containing an insecticidally effective amount of an insecticide.

The following examples further illustrate the present invention, but, of course, should not be construed as in any way limiting its scope. The examples set forth certain biological data illustrating the efficacy of the compositions of the  
20 present invention in controlling general household pests. Each example embodies a separate test wherein the pests were randomly selected from a population at a random age. As a result, from example to example, the ages of the pests can be very different. This age difference potentially translates to different baselines for each example. Therefore, data should only be compared within the example and not from  
25 example to example due to the differences in age of the pests from example to example. Unless otherwise indicated, all parts, percentages, and the like are by weight. The spray chamber used in the examples was approximately 76 inches tall, 73 inches long and 31 inches deep with an adjustable shelf (approximately 22 inches deep) and a movable spray nozzle. The spray chambers were calibrated to deliver a  
30 volume of approximately 1 gallon of liquid per 1000 square feet of area at about 14 pounds per square inch of pressure. A DeVilbiss hand held sprayer (Atomizer model 152) manufactured by DeVilbiss located in Glendale Heights, Illinois was

used in testing house flies and mosquitoes. The DeVilbiss was used to apply approximately 3-5 milliliters of product at about 10 pounds per square inch.

#### EXAMPLE 1

##### 5 Test to Determine German Cockroach Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

The compositions of the present invention were tested for German cockroach activity in the following manner:

10 Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and imidacloprid, as well as bifenthrin and imidacloprid alone.

The spray chamber was then calibrated to deliver the treatment solution at 15 the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired 20 number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male German cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. German cockroach mortality was measured. The following results were recorded:

25

Table 1  
Mortality of German Cockroach by Application of Combinations of Bifenthrin and Imidacloprid

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 1 day (%)	Mortality Rate @ 2 days (%)
A	10	0.001	3	33	33	60
	50	0.005	30	48	58	100
B	100	0.01	15	18	20	20
	200	0.02	15	18	18	23
A + B	10/100	0.001 / 0.01	50	60	68	85

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 1 day (%)	Mortality Rate @ 2 days (%)
A + B	10/200	0.001 / 0.02	63	73	73	100
	50/100	0.005 / 0.01	100	100	100	100
	50/200	0.005 / 0.02	100	100	100	100
Untreated	0	0	0	0	0	3

A is bifenthrin  
B is imidacloprid

5

## EXAMPLE 2

### Test to Determine German Cockroach Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

10

The compositions of the present invention were tested for German cockroach activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and imidacloprid, as well as bifenthrin and imidacloprid alone.

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male German cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. German cockroach knockdown and mortality were measured. The following results were recorded:

30



Table 2  
Knockdown and Mortality of German Cockroach by Application of Combinations of  
Bifenthrin and Imidacloprid

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 10 minute (%)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minutes (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 1 day (%)
A	200	0.02	0	3	45	100	100	100
	600	0.06	0	8	60	100	100	100
B	250	0.025	5	20	50	75	75	70
	500	0.05	3	20	83	95	100	83
	1000	0.10	10	23	73	100	100	90
A + B	200/250	0.02 / 0.025	0	10	68	98	100	100
	200/500	0.02 / 0.05	15	50	98	100	100	100
	200/1000	0.02 / 0.10	28	75	93	100	100	100
	600/250	0.06 / 0.025	15	60	90	100	100	100
	600/500	0.06 / 0.05	15	60	95	100	100	100
	600 / 1000	0.06 / 0.10	20	58	95	100	100	100
	Untreated	0	0	0	0	0	0	0

5

A is bifenthrin  
B is imidacloprid

10

### EXAMPLE 3

#### Test to Determine American Cockroach Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

The compositions of the present invention were tested for American  
15 cockroach activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and imidacloprid, as well as bifenthrin and imidacloprid alone.

20 The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles  
25 were marked on the aluminum foil with a permanent marker. The inside of a desired

number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male American cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. American cockroach  
5 knockdown and mortality were measured. The following results were recorded:

Table 3  
Knockdown and Mortality of American Cockroach by Application of Combinations of Bifenthrin and Imidacloprid

10

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)	Mortality Rate @ 2 days (%)
A	10	0.001	0	0	0	0	5	15	25
	50	0.005	0	0	5	5	10	65	70
B	100	0.01	0	5	0	5	25	60	65
	200	0.02	0	0	0	0	15	35	45
A + B	10/100	0.001 / 0.01	0	5	10	10	55	75	80
	10/200	0.001 / 0.02	0	10	10	10	50	70	75
	50/100	0.005 / 0.01	5	30	35	40	95	95	95
	50/200	0.005 / 0.02	5	15	15	25	65	80	100
Untreated	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is imidacloprid

15

#### EXAMPLE 4

20 Test to Determine Oriental Cockroach Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

The compositions of the present invention were tested for Oriental cockroach activity in the following manner:

25 Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and imidacloprid, as well as bifenthrin and imidacloprid alone.

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male Oriental cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. Oriental cockroach knockdown and mortality were measured. The following results were recorded:

Table 4  
Knockdown and Mortality of Oriental Cockroach by Application of Combinations of Bifenthrin and Imidacloprid

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)	Mortality Rate @ 2 days (%)
A	10	0.001	0	0	0	0	0	15	15
	50	0.005	0	0	5	5	30	70	70
B	100	0.01	0	0	0	10	70	70	75
	200	0.02	0	0	0	5	80	85	95
A + B	10/100	0.001 / 0.01	0	20	20	70	100	100	100
	10/200	0.001 / 0.02	0	30	30	100	100	100	100
	50/100	0.005 / 0.01	0	45	45	100	100	100	100
	50/200	0.005 / 0.02	0	45	45	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is imidacloprid

20

#### EXAMPLE 5

Test to Determine Red Imported Fire Ant Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

25

The compositions of the present invention were tested for red imported fire ant activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and imidacloprid, as well as bifenthrin and imidacloprid alone.

5 The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. The red imported fire ants to be  
10 treated were collected and placed in screened 16 oz paper cups. The paper cups were placed onto the aluminum foil on the spray chamber shelf. The sprayer was activated and the test compound was applied to each paper cup interior. Red imported fire ant knockdown and mortality were measured. The following results were recorded:

15

Table 5  
Knockdown and Mortality of Red Imported Fire Ant by Application of  
Combinations of Bifenthrin and Imidacloprid

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 5 minute (%)	Knock-down Rate @ 10 minute (%)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute s (%)	Mortal-ity Rate @ 60 minute s (%)	Mortal-ity Rate @ 120 minute s (%)	Mortal-ity Rate @ 4 hours (%)	Mortal-ity Rate @ 1 day (%)
A	10	0.001	30	93	95	100	65	100	100	100
	50	0.005	10	70	95	100	100	100	100	100
B	100	0.01	15	25	55	93	78	95	100	100
	200	0.02	5	10	20	30	48	100	100	100
A + B	10/100	0.001 / 0.01	35	95	100	100	100	100	100	100
	10/200	0.001 / 0.02	15	70	98	100	100	100	100	100
	50/100	0.005 / 0.01	50	80	100	100	100	100	100	100
	50/200	0.005 / 0.02	35	95	98	100	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0	0

20

A is bifenthrin  
B is imidacloprid

25

## EXAMPLE 6

## Test to Determine Red Imported Fire Ant Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

5 The compositions of the present invention were tested for red imported fire ant activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and  
10 imidacloprid, as well as bifenthrin and imidacloprid alone.

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from  
15 front-to-back and end-to-end was determined. The red imported fire ants to be treated were collected and placed in screened 16 oz paper cups. The paper cups were placed onto the aluminum foil on the spray chamber shelf. The sprayer was activated and the test compound was applied to each paper cup interior. Red imported fire ant knockdown and mortality were measured. The following results  
20 were recorded:

Table 6  
Knockdown and Mortality of Red Imported Fire Ant by Application of  
Combinations of Bifenthrin and Imidacloprid

25

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 5 minute (%)	Knock-down Rate @ 10 minute (%)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Mortality Rate @ 60 minute (%)	Mortality Rate @ 120 minute (%)	Mortality Rate @ 4 hours (%)
A	200	0.02	0	0	70	88	100	100	100
	600	0.06	0	40	88	100	100	100	100
B	250	0.025	0	0	0	5	73	100	100
	500	0.05	0	0	0	10	88	100	100
	1000	0.10	0	0	3	33	98	100	100
A + B	200/250	0.02 / 0.025	3	5	15	100	98	100	100
	200/500	0.02 / 0.05	0	8	50	100	100	100	100
	200/1000	0.02 / 0.10	0	10	80	100	100	100	100
	600/250	0.06 / 0.025	0	65	100	100	100	100	100

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 5 minute (%)	Knock-down Rate @ 10 minute (%)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 4 hours (%)
A + B	600/500	0.06 / 0.05	15	83	100	100	100	100	100
	600 / 1000	0.06 / 0.10	43	98	100	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is imidacloprid

5

## EXAMPLE 7

### Test to Determine House Fly Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Imidacloprid

10 The compositions of the present invention were tested for house fly activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a wettable powder of imidacloprid (MERIT) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and  
15 imidacloprid, as well as bifenthrin and imidacloprid alone.

A DeVilbiss hand held sprayer was used to deliver the treatment solution at the desired volume and pressure. The house flies to be treated were collected and placed in screened 16 oz paper cups. The hand held sprayer was activated and the test compound was applied to each paper cup interior. House fly knockdown and  
20 mortality were measured. The following results were recorded:

Table 7  
Knockdown and Mortality of House Fly by Application of Combinations of Bifenthrin and Imidacloprid

25

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Knock-down Rate @ 45 minutes (%)	Knock-down Rate @ 60 minutes (%)	Knock-down Rate @ 120 minutes (%)	Knock-down Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)
A	10	0.001	0	0	17	40	63	50	30
	50	0.005	0	78	97	97	97	97	97
B	100	0.01	42	91	91	100	94	94	97
	200	0.02	62	100	100	100	95	97	97
A + B	10/100	0.001 / 0.01	44	94	94	94	94	94	72

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Knock-down Rate @ 45 minutes (%)	Knock-down Rate @ 60 minutes (%)	Knock-down Rate @ 120 minutes (%)	Knock-down Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)
A + B	10/200	0.001 / 0.02	88	97	94	97	97	100	82
	50/100	0.005 / 0.01	69	100	100	100	100	100	100
	50/200	0.005 / 0.02	87	100	100	100	100	100	97
Untreated	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is imidacloprid

5

## EXAMPLE 8

Test to Determine German Cockroach Mortality Rates by Applications of  
Combinations of Bifenthrin and Thiamethoxam

10       The compositions of the present invention were tested for German cockroach activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a water dispersible granular of thiamethoxam (CENTRIC) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and thiamethoxam, as well as bifenthrin and thiamethoxam alone.

15       The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were place on the sieve circles. 10 male German cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. German cockroach mortality was measured.

25       The following results were recorded:

30

**Table 8**  
**Mortality of German Cockroach by Application of Combinations of Bifenthrin and Thiamethoxam**

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 1 day (%)	Mortality Rate @ 2 day (%)	Mortality Rate @ 4 days (%)
A	10	0.001	8	33	35	60	98
	50	0.005	15	48	58	100	100
B	100	0.01	0	45	90	93	93
	200	0.02	13	63	98	100	100
A + B	10/100	0.001 / 0.01	5	50	95	100	100
	10/200	0.001 / 0.02	38	75	100	100	100
	50/100	0.005 / 0.01	33	80	100	100	100
	50/200	0.005 / 0.02	40	88	100	100	100
Untreated	0	0	0	0	0	3	5

A is bifenthrin  
 B is thiamethoxam

#### EXAMPLE 9

#### Test to Determine American Cockroach Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Thiamethoxam

The compositions of the present invention were tested for American cockroach activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a water dispersible granular of thiamethoxam (CENTRIC) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and thiamethoxam, as well as bifenthrin and thiamethoxam alone.

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were place on the sieve circles. 10 male American



cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. American cockroach knockdown and mortality were measured. The following results were recorded:

5

Table 9  
Knockdown and Mortality of American Cockroach by Application of Combinations of Bifenthrin and Thiamethoxam

10

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)
A	10	0.001	0	0	0	0	0	5
	50	0.005	0	0	0	0	0	30
B	100	0.01	0	0	0	0	0	20
	200	0.02	0	0	0	0	10	35
A + B	10/100	0.001 / 0.01	0	5	0	0	5	35
A + B	10/200	0.001 / 0.02	5	0	5	5	20	70
	50/100	0.005 / 0.01	0	0	0	0	0	45
	50/200	0.005 / 0.02	0	0	0	0	20	55
Untreated	0	0	0	0	0	0	0	0

A is bifenthrin  
B is thiamethoxam

15

#### EXAMPLE 10

Test to Determine Oriental Cockroach Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Thiamethoxam

20

The compositions of the present invention were tested for Oriental cockroach activity in the following manner:

25

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a water dispersible granular of thiamethoxam (CENTRIC) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and thiamethoxam, as well as bifenthrin and thiamethoxam alone.

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from

front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male Oriental cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. Oriental cockroach knockdown and mortality were measured. The following results were recorded:

Table 10  
Knockdown and Mortality of Oriental Cockroach by Application of Combinations of Bifenthrin and Thiamethoxam

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)
A	10	0.001	0	0	0	0	0	0
	50	0.005	0	0	0	0	0	45
B	100	0.01	0	0	0	0	0	20
	200	0.02	0	0	0	0	0	5
A + B	10/100	0.001 / 0.01	0	0	0	0	0	5
	10/200	0.001 / 0.02	0	0	0	0	0	40
	50/100	0.005 / 0.01	0	0	0	0	0	35
	50/200	0.005 / 0.02	0	0	0	0	10	65
Untreated	0	0	0	0	0	0	0	0

A is bifenthrin  
B is thiamethoxam

#### EXAMPLE 11

Test to Determine House Fly Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Thiamethoxam

The compositions of the present invention were tested for house fly activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a water dispersible granular of thiamethoxam (CENTRIC) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and thiamethoxam, as well as bifenthrin and thiamethoxam alone.

A DeVilbiss hand held sprayer was used to deliver the treatment solution at the desired volume and pressure. The house flies to be treated were collected and placed in screened 16 oz paper cups. The hand held sprayer was activated and the test compound was applied to each paper cup interior. House fly knockdown and mortality were measured. The following results were recorded:

Table 11  
Knockdown and Mortality of House Fly by Application of Combinations of Bifenthrin and Thiamethoxam

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Knock-down Rate @ 45 minutes (%)	Knock-down Rate @ 60 minutes (%)	Knock-down Rate @ 120 minutes (%)	Knock-down Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)
A	10	0.001	0	0	6	19	19	48	3
	50	0.005	0	19	47	59	63	100	63
B	25	0.0025	13	44	47	56	50	38	50
	50	0.005	12	15	15	15	6	6	12
A + B	10/25	0.001 / 0.0025	5	57	62	71	90	90	57
	50/25	0.005 / 0.0025	3	78	100	100	100	100	100
	10/50	0.001 / 0.005	25	50	61	72	94	89	61
	50/50	0.005 / 0.005	24	88	100	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is thiamethoxam

#### EXAMPLE 12

Test to Determine House Fly Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Thiamethoxam

The compositions of the present invention were tested for house fly activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a water dispersible granular of thiamethoxam (CENTRIC) in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and thiamethoxam, as well as bifenthrin and thiamethoxam alone.

A DeVilbiss hand held sprayer was used to deliver the treatment solution at the desired volume and pressure. The house flies to be treated were collected and placed in screened 16 oz paper cups. The hand held sprayer was activated and the test compound was applied to each paper cup interior. House fly knockdown and mortality were measured. The following results were recorded:

Table 12  
Knockdown and Mortality of House Fly by Application of Combinations of Bifenthrin and Thiamethoxam

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock-down Rate @ 15 minute (%)	Knock-down Rate @ 30 minute (%)	Knock-down Rate @ 45 minutes (%)	Knock-down Rate @ 60 minutes (%)	Knock-down Rate @ 120 minutes (%)	Knock-down Rate @ 4 hours (%)	Mortality Rate @ 1 day (%)
A	10	0.001	0	0	17	40	63	50	30
	50	0.005	0	78	97	97	97	97	97
B	100	0.01	42	91	91	100	94	94	97
	200	0.02	62	100	100	100	95	97	97
A + B	10/100	0.001 / 0.01	46	100	100	100	100	100	100
	10/200	0.001 / 0.02	82	100	100	100	100	100	100
	50/100	0.005 / 0.01	89	97	100	100	100	100	100
	50/200	0.005 / 0.02	97	100	100	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is thiamethoxam

### EXAMPLE 13

Test to Determine German Cockroach Mortality Rates by Applications of Combinations of Bifenthrin and Clothianidin

The compositions of the present invention were tested for German cockroach activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a 16% a.i. water dispersible granular of clothianidin in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and clothianidin, as well as bifenthrin and clothianidin alone.

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male German cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. German cockroach mortality was measured. The following results were recorded:

Table 13  
Mortality of German Cockroach by Application of Combinations of Bifenthrin and Clothianidin

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 1 day (%)	Mortality Rate @ 2 days (%)	Mortality Rate @ 4 days (%)
A	10	0.001	8	33	35	60	100
	50	0.005	15	48	58	100	100
B	100	0.01	18	35	58	75	85
	200	0.02	38	60	73	98	100
A + B	10/100	0.001 / 0.01	35	55	98	98	100
	10/200	0.001 / 0.02	60	83	100	100	100
	50/100	0.005 / 0.01	45	63	100	100	100
	50/200	0.005 / 0.02	65	75	100	100	100
Untreated	0	0	0	0	0	3	5

A is bifenthrin  
B is clothianidin

#### EXAMPLE 14

Test to Determine American Cockroach Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Clothianidin

The compositions of the present invention were tested for American cockroach activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a 16% a.i. water dispersible granular of clothianidin in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and clothianidin, as well as bifenthrin and clothianidin alone.

- 5 The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles  
10 were marked on the aluminum foil with a permanent marker. The inside of a desired number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were place on the sieve circles. 10 male American cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. American cockroach  
15 knockdown and mortality were measured. The following results were recorded:

Table 14  
Knockdown and Mortality of American Cockroach by Application of Combinations of Bifenthrin and Clothianidin

20

Treat- ment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock- down Rate @ 10 minute (%)	Knock- down Rate @ 15 minute (%)	Knock- down Rate @ 30 minute (%)	Mortal- ity Rate @ 60 minute (%)	Mortal- ity Rate @ 120 minute s (%)	Mortal- ity Rate @ 4 hours (%)	Mortal- ity Rate @ 1 day (%)	Mortal- ity Rate @ 2 days (%)
A	10	0.001	0	0	0	0	0	0	10	30
	50	0.005	5	10	5	0	0	35	40	55
B	100	0.01	0	10	25	0	0	35	50	60
	200	0.02	0	0	0	0	5	20	60	60
A + B	10/100	0.001 /	5	5	10	0	5	25	35	35
		0.01								
	10/200	0.001 /	0	0	0	0	10	25	85	85
		0.02								
	50/100	0.005 /	5	0	20	0	0	35	50	50
		0.01								
	50/200	0.005 /	0	5	15	0	10	70	90	90
		0.02								
Untreat- ed	0	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is clothianidin

## EXAMPLE 15

5      Test to Determine Oriental Cockroach Knockdown and Mortality Rates by  
Applications of Combinations of Bifenthrin and Clothianidin

The compositions of the present invention were tested for Oriental cockroach activity in the following manner:

10      Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a 16% a.i. water dispersible granular of clothianidin in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and clothianidin, as well as bifenthrin and clothianidin alone.

The spray chamber was then calibrated to deliver the treatment solution at  
15 the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. A desired number of 4.0" sieve circles were marked on the aluminum foil with a permanent marker. The inside of a desired  
20 number of PVC rings were coated with a petroleum jelly / mineral oil mixture (1:2 ratio). The PVC rings were placed on the sieve circles. 10 male Oriental cockroaches were placed inside each PVC ring. The sprayer was activated and the test compound was applied to each PVC ring interior. Oriental cockroach knockdown and mortality were measured. The following results were recorded:

25

Table 15  
Knockdown and Mortality of Oriental Cockroach by Application of Combinations of Bifenthrin and Clothianidin

Treat- ment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock- down Rate @ 10 minute (%)	Knock- down Rate @ 15 minute (%)	Knock- down Rate @ 30 minute (%)	Mortal- ity Rate @ 60 minute (%)	Mortal- ity Rate @ 120 minute (%)	Mortal- ity Rate @ 4 hours (%)	Mortal- ity Rate @ 1 day (%)	Mortal- ity Rate @ 2 days (%)
A	10	0.001	0	0	0	0	0	0	0	3
	50	0.005	0	0	0	0	0	10	20	23
B	100	0.01	0	0	0	0	5	8	50	50
	200	0.02	0	3	3	3	3	15	50	50
A + B	10/100	0.001 / 0.01	5	0	0	0	0	13	43	45
	10/200	0.001 / 0.02	0	0	0	0	0	18	48	48

Treat- ment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock- down Rate @ 10 minute (%)	Knock- down Rate @ 15 minute (%)	Knock- down Rate @ 30 minute (%)	Mortal- ity Rate @ 60 minute (%)	Mortal- ity Rate @ 120 minute (%)	Mortal- ity Rate @ 4 hours (%)	Mortal- ity Rate @ 1 day (%)	Mortal- ity Rate @ 2 days (%)
A + B	50/100	0.005 / 0.01	0	5	5	8	13	50	50	50
	50/200	0.005 / 0.02	0	0	0	0	18	48	50	50
Untreat- ed	0	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is clothianidin

5

## EXAMPLE 16

Test to Determine Red Imported Fire Ant Knockdown and Mortality Rates by  
Applications of Combinations of Bifenthrin and Clothianidin

10

The compositions of the present invention were tested for red imported fire ant activity in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a 16% a.i. water dispersible granular of clothianidin in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and clothianidin, as well as bifenthrin and clothianidin alone.

15

The spray chamber was then calibrated to deliver the treatment solution at the desired volume and pressure over the desired area on the chamber shelf. Spray chamber shelf height was adjusted to approximately 18 inches from the spray tip. The shelf was then covered with aluminum foil and the center of the shelf from front-to-back and end-to-end was determined. The red imported fire ants to be treated were collected and placed in screened 16 oz paper cups. The paper cups were placed onto the aluminum foil on the spray chamber shelf. The sprayer was activated and the test compound was applied to each paper cup interior. Red imported fire ant knockdown and mortality were measured. The following results were recorded:

20

25

30



Table 16  
Knockdown and Mortality of Red Imported Fire Ant by Application of  
Combinations of Bifenthrin and Clothianidin

Treat- ment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock- down Rate @ 5 minute (%)	Knock- down Rate @ 10 minute (%)	Knock- down Rate @ 15 minute (%)	Knock- down Rate @ 30 minutes (%)	Mortality Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortality Rate @ 4 hours (%)
A	10	0.001	30	93	95	100	65	100	100
	50	0.005	10	70	95	100	100	100	100
B	100	0.01	35	70	78	100	75	83	98
	200	0.02	20	30	53	65	53	88	100
A + B	10/100	0.001 / 0.01	8	78	100	100	100	100	100
	10/200	0.001 / 0.02	15	60	95	100	100	100	100
	50/100	0.005 / 0.01	25	90	100	100	100	100	100
	50/200	0.005 / 0.02	15	88	100	100	100	100	100
Untreat- ed	0	0	0	0	0	0	0	0	0

A is bifenthrin  
B is clothianidin

#### EXAMPLE 17

#### Test to Determine House Fly Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Clothianidin

The compositions of the present invention were tested for house fly activity  
in the following manner:

Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and  
a 16% a.i. water dispersible granular of clothianidin in distilled water were prepared  
that provided appropriate rates of application of combinations of bifenthrin and  
clothianidin, as well as bifenthrin and clothianidin alone.

A DeVilbiss hand held sprayer was used to deliver the treatment solution at  
the desired volume and pressure. The house flies to be treated were collected and  
placed in screened 16 oz paper cups. The hand held sprayer was activated and the  
test compound was applied to each paper cup interior. House fly knockdown and  
mortality were measured. The following results were recorded:

Table 17  
Knockdown and Mortality of House Flies by Application of Combinations of  
Bifenthrin and Clothianidin

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock -down Rate @ 15 minutes (%)	Knock -down Rate @ 30 minutes (%)	Knock- down Rate @ 45 minutes (%)	Knock- down Rate @ 60 minutes (%)	Knock- down Rate @ 120 minutes (%)	Knock -down Rate @ 180 minutes (%)	Knock -down Rate @ 4 hours (%)	Mortal- ity Rate @ 1 day (%)
A	10	0.001	0	0	0	0	3	3	3	3
	50	0.005	3	55	66	68	74	74	76	79
B	100	0.01	97	100	100	100	47	59	44	88
	200	0.02	94	100	100	100	71	38	47	97
A + B	10/100	0.001 / 0.01	65	97	100	100	100	100	84	100
	10/200	0.001 / 0.02	93	100	100	100	100	100	100	100
	50/100	0.005 / 0.01	91	94	100	100	97	91	85	97
	50/200	0.005 / 0.02	100	100	100	100	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0	0

5

A is bifenthrin  
B is clothianidin

#### EXAMPLE 18

#### 10      Test to Determine Yellow Fever Mosquito Knockdown and Mortality Rates by Applications of Combinations of Bifenthrin and Clothianidin

The compositions of the present invention were tested for Yellow Fever Mosquito activity in the following manner:

15      Test compositions made up of TALSTARONE® MULTI-INSECTICIDE and a 16% a.i. water dispersible granular of clothianidin in distilled water were prepared that provided appropriate rates of application of combinations of bifenthrin and clothianidin, as well as bifenthrin and clothianidin alone.

20      A DeVilbiss hand held sprayer was used to deliver the treatment solution at the desired volume and pressure. The Yellow Fever Mosquitoes to be treated were collected and placed in screened 16 oz paper cups. The hand held sprayer was activated and the test compound was applied to each paper cup interior. Yellow Fever Mosquito knockdown and mortality were measured. The following results were recorded:

25

Table 18  
Knockdown and Mortality of Yellow Fever Mosquito by Application of  
Combinations of Bifenthrin and Clothianidin

Treatment	Rate of Appln. (PPM)	Rate of Appln. (% by weight)	Knock- down Rate @ 15 minute (%)	Knock- down Rate @ 30 minute (%)	Mortal- ity Rate @ 45 minutes (%)	Mortal- ity Rate @ 60 minutes (%)	Mortality Rate @ 120 minutes (%)	Mortal- ity Rate @ 180 minute (%)	Mortal- ity Rate @ 4 hours (%)	Mortal- ity Rate @ 1 day (%)
A	10	0.001	27	97	100	100	100	100	100	100
	50	0.005	90	100	100	100	100	100	100	100
B	100	0.01	0	0	7	7	3	7	10	53
	200	0.02	3	11	17	31	37	40	40	60
A + B	10/100	0.001 / 0.01	17	100	100	100	100	100	100	100
	10/200	0.001 / 0.02	39	94	100	100	100	100	100	100
	50/100	0.005 / 0.01	97	100	100	100	100	100	100	100
	50/200	0.005 / 0.02	100	100	100	100	100	100	100	100
Untreated	0	0	0	0	0	0	0	0	0	0

5

A is bifenthrin  
B is clothianidin

- 10 In the context of the present invention, the term "insecticide" refers to the active chemical compound or ingredient, such as bifenthrin, cypermethrin, zeta cypermethrin, lambdacyhalothrin, betacyhalothrin, alphacypermethrin, tralomethrin, deltamethrin, cyfluthrin, beta-cyfluthrin, esfenvalerate, fluvalinate, etofenprox, permethrin, metofluthrin, resmethrin, bioresmethrin, allethrin, bioallethrin, s-
- 15 bioallethrin, tetramethrin, imidacloprid, nithiazine, thiamethoxam, dinotefuran, nitenpyram, thiacloprid, clothianidin, or chlorfenapyr, that kills or causes knockdown of insects. The term "bifenthrin" means 2-methylbiphenyl-3-ylmethyl (Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-
- 20 dimethylcyclopropanecarboxylate or 2-methylbiphenyl-3-ylmethyl (Z)-(1RS, 3RS)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate, CAS Registry Number 82657-04-3. The term "imidacloprid" means (EZ)-1-(6-chloro-3-pyridylmethyl)-N-nitroimidazolidin-2-ylideneamine, CAS Registry Number 138261-41-3. The term "thiamethoxam" means (EZ)-3-(2-chloro-1,3-thiazol-5-ylmethyl)-5-methyl-1,3,5-oxadiazinan-4-ylidene(nitro)amine, CAS Registry
- 25 Number 153719-23-4. The term "clothianidin" means (E)-1-(2-chloro-1,3-thiazol-5-ylmethyl)-3-methyl-2-nitroguanidine, CAS Registry Number 210880-92-5 (formerly

205510-53-8). The term "liquid insecticide" refers to a formulation of an insecticide where the formulation can be dispensed in an aqueous medium prior to its application to a locus where insect control is desired. The term "locus" refers to any location where control of insects is needed or expected to be needed. The term

5 "general household pest" refers to any insect or pest, such as German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug, that cause harm or nuisance to person or property.

10 The term "knockdown" refers to the quick, short-term immobilization or death of the insects. The term "mortality" refers to the death of the insects. The term "% by weight" refers to the weight of the insecticide or specified component as a percent of the total weight of the composition (e.g. including the aqueous medium, other insecticides, surfactants, wetting agents, freeze/thaw agents and combinations

15 thereof).

Those of ordinary skill in the art will appreciate that variations of the invention may be used and that it is intended that the invention may be practiced otherwise than as specifically described herein. Accordingly, this invention includes all modifications encompassed within the spirit and scope of the invention as

20 defined by the following claims.

What is claimed is:

Claim 1. An insecticidal composition comprising a mixture of

- i) a pyrethroid and
- ii) a second insecticide selected from the group consisting of imidacloprid, nithiazine, thiamethoxam, dinotefuran, nitenpyram, thiacloprid, clothianidin and chlorfenapyr.

Claim 2. A composition according to claim 1, wherein said pyrethroid is selected from the group consisting of bifenthrin, cypermethrin, zeta cypermethrin, lambdacyhalothrin, betacyhalothrin, alphacypermethrin, tralomethrin, deltamethrin, cyfluthrin, beta-cyfluthrin, esfenvalerate, fluvalinate, etofenprox, permethrin, metofluthrin, resmethrin, bioresmethrin, allethrin, bioallethrin, s-bioallethrin and tetramethrin.

Claim 3. A composition according to claim 2, wherein said pyrethroid is bifenthrin.

Claim 4. A composition according to claim 1, wherein said second insecticide is selected from the group consisting of imidacloprid, thiamethoxam and clothianidin.

Claim 5. A composition according to claim 4, wherein the amount of the second insecticide is equal to from 0.001% by weight to 0.20% by weight.

Claim 6. A method for controlling general household pests comprising applying an insecticidally effective amount of a composition of claim 1 to a locus where general household pest control is needed or expected to be needed.

Claim 7. A method for controlling general household pests comprising applying an insecticidally effective amount of a composition of claim 2 to a locus where general household pest control is needed or expected to be needed.

Claim 8. A method for controlling general household pests comprising applying an insecticidally effective amount of a composition of claim 3 to a locus where general household pest control is needed or expected to be needed.

Claim 9. A method for controlling general household pests comprising applying an insecticidally effective amount of a composition of claim 4 to a locus where general household pest control is needed or expected to be needed.

Claim 10. A method for controlling general household pests comprising applying an insecticidally effective amount of a composition of claim 5 to a locus where general household pest control is needed or expected to be needed.

Claim 11. The method according to claim 6, wherein said general household pest is selected from German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug.

Claim 12. The method according to claim 7, wherein said general household pest is selected from German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug.

Claim 13. The method according to claim 8, wherein said general household pest is selected from German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant

(RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug.

Claim 14. The method according to claim 9, wherein said general household pest is selected from German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug.

Claim 15. The method according to claim 10, wherein said general household pest is selected from German cockroach, American cockroach, Smokey-Brown cockroach, Oriental cockroach, house fly, biting fly, filth fly, red imported fire ant (RIFA), odorous house ant, carpenter ant, pharaoh ant, Argentine ant, mosquito, tick, flea, sowbug, pillbug, centipede, spider, silverfish, scorpion and bed bug.

Claim 16. The method according to claim 6, wherein said locus is selected from a general household pest-infested structure, a structure that is expected to be general household pest-infested, or a location adjacent to said structures.

Claim 17. The method according to claim 7, wherein said locus is selected from a general household pest-infested structure, a structure that is expected to be general household pest-infested, or a location adjacent to said structures.

Claim 18. The method according to claim 8, wherein said locus is selected from a general household pest-infested structure, a structure that is expected to be general household pest-infested, or a location adjacent to said structures.

Claim 19. The method according to claim 9, wherein said locus is selected from a general household pest-infested structure, a structure that is expected to be general household pest-infested, or a location adjacent to said structures.

Claim 20. The method according to claim 10, wherein said locus is selected from a general household pest-infested structure, a structure that is expected to be general household pest-infested, or a location adjacent to said structures.



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US05/00584

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : AOIN 53/12

US CL : 514/531

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 514/531, 424/405,406

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
WEST

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/0053786 A1 (SELBY et al) 18 MARCH 2004, see claims 1,11-14 and [0182].	1-20

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"B" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

13 May 2005 (13.05.2005)

Date of mailing of the international search report

27 MAY 2005

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